

## NEW CLAIMS

71. In a computer system having a data input device, a data storage device, and a processor, a method for determining a travel scheme for minimizing travel costs for an organization, where the organization expects to purchase travel trips for a plurality of travelers for a plurality of predetermined travel links, each travel link comprising a travel origin and a travel destination, each travel link being served by at least one of a plurality of travel carriers, the method comprising the steps of:

obtaining travel information relating to the carriers and the links via the data input device;

storing the travel information via the data storage device;

constructing an objective function from the travel information via the processor, the objective function representing a travel cost to the organization to purchase travel trips for the plurality of travelers for the plurality of predetermined links;

constructing a set of constraints from the travel information via the processor, the constraints comprising restrictions relating to the objective function;

applying the constraints to the objective function via the processor to determine a solution of the objective function that satisfies the constraints and that minimizes the travel costs of the organization; and

generating output report data representative of the solution.

72. The computer system of claim 71 wherein the obtaining travel information step comprises the steps of:

obtaining travel cost information for each link for each carrier serving the link;

obtaining demand and supply information pertaining to a projected demand for each link and a projected supply for each carrier; and

obtaining carrier goal information pertaining to any predetermined goal the organization has with respect to any of the carriers.

73. The computer system of claim 72 wherein the processor determines from the travel cost information for each link for each carrier serving the link a weighted value representing an actual cost to the organization for traveling the link using the carrier.

74. The computer system of claim 73 wherein the objective function comprises the sum of a travel cost for each link, the travel cost for each link comprising the sum of a travel cost for each carrier serving the link, the travel cost for each carrier serving the link comprising the weighted value representing the actual cost to the organization for traveling the link using the carrier multiplied by a variable representing a number of trips to be purchased from the carrier for the link.

75. The computer system of claim 74 wherein the solution comprises a solution value for each variable.

76. The computer system of claim 75 wherein the processor determines lower and upper limits for each constraint, each constraint being adjustable between the limits while maintaining the determined solution.

77. The computer system of claim 75 wherein the processor determines lower and upper limits for each solution value, each solution value being adjustable between the limits while maintaining the determined solution.

78. The computer system of claim 74 wherein the constraints are derived from the demand and supply information and the carrier goal information, the constraints comprising link demand constraints, carrier supply constraints, and carrier goal constraints, the link demand constraints requiring that for each link the sum of the variables representing the number of trips to be purchased from all carriers for the link be equal to the projected demand for the link, each carrier supply constraint requiring that for a particular carrier the sum of the variables representing the number of trips to be purchased from the carrier for all links be in a predetermined range, each carrier goal constraint requiring that the goal the organization has with respect to a particular carrier be accomplished.

79. The computer system of claim 72 wherein the processor determines the obtained information in the form of a table.

80. The computer system of claim 79 wherein the processor organizes organizing each of the plurality of links in a first direction on the table and each of the plurality of carriers in a second direction on the table, each carrier serving each link being designated by a cell on the table having information pertaining to the carrier serving the link.

81. The computer system of claim 80 wherein the processor organizes the link demand information according to each link and the carrier supply information and carrier goal information according to each carrier.

82. The computer system of claim 81 wherein the processor employs linear programming to apply the constraints to the objective function to determine the solution.

83. The computer system of claim 82 wherein the processor organizes the solution in the form of a table corresponding to the table of the obtained information.

84. The computer system of claim 72 wherein the obtaining travel cost information step comprises acquiring current travel data from a computerized reservation system.

85. The computer system of claim 72 wherein the obtaining travel cost information step comprises acquiring previously generated historical travel data from a historical travel data file.

86. The computer system of claim 72 wherein the obtaining demand and supply information and obtaining carrier goal information steps comprise acquiring the demand and supply information and the carrier goal information for the organization from a previously generated organization discount program data file.

87. The computer system of claim 71 wherein the processor employs linear programming to apply the constraints to the objective function to determine the solution.

✓ 88. A method for determining a travel scheme for minimizing travel costs for an organization, where the organization expects to purchase travel trips for a plurality of travelers for a plurality of predetermined travel links, each travel link comprising a travel origin and a travel destination, each travel link being served by at least one of a plurality of travel carriers, the method comprising the steps of:

obtaining travel information relating to the carriers and the links;

constructing an objective function from the travel information, the objective function representing a travel cost to the organization to purchase travel trips for the plurality of travelers for the plurality of predetermined links;

constructing a set of constraints from the travel information, the constraints comprising restrictions relating to the objective function;

applying the constraints to the objective function to determine a solution of the objective function that satisfies the constraints and that minimizes the travel costs of the organization; and

generating a report representative of the solution.

89. The method of claim 88 wherein the obtaining travel information step comprises the steps of:

obtaining travel cost information for each link for each carrier serving the link;

obtaining demand and-supply information pertaining to a projected demand for each link and a projected supply for each carrier; and

obtaining carrier goal information pertaining to any predetermined goal the organization has with respect to any of the carriers.

90. The method of claim 89 further comprising the step of determining from the travel cost information for each link for each carrier serving the link a weighted value representing an actual cost to the organization for traveling the link using the carrier.

91. The method of claim 90 wherein the objective function comprises the sum of a travel cost for each link, the travel cost for each link comprising the sum of a travel cost for each carrier serving the link, the travel cost for each carrier serving the link comprising the weighted value representing the actual cost to the organization for traveling the link using the carrier

multiplied by a variable representing a number of trips to be purchased from the carrier for the link.

92. The method of claim 91 wherein the solution comprises a solution value for each variable.

93. The method of claim 92 further comprising the step of determining lower and upper limits for each constraint, each constraint being adjustable between the limits while maintaining the determined solution.

94. The method of claim 92 further comprising the step of determining lower and upper limits for each solution value, each solution value being adjustable between the limits while maintaining the determined solution.

95. The method of claim 91 wherein the constraints are derived from the demand and supply information and the carrier goal information, the constraints comprising link demand constraints, carrier supply constraints, and carrier goal constraints, the link demand constraints requiring that for each link the sum of the variables representing the number of trips to be purchased from all carriers for the link be equal to the projected demand for the link, each carrier supply constraint requiring that for a particular carrier the sum of the variables representing the number of trips to be purchased from the carrier for all links be in a predetermined range, each carrier goal constraint requiring that the goal the organization has with respect to a particular carrier be accomplished.

96. The method of claim 89 further comprising the step of organizing the obtained information in the form of a table.

97. The method of claim 96 wherein the organizing step comprises organizing each of the plurality of links in a first direction on the table and each of the plurality of carriers in a second direction on the table, each carrier serving each link being designated by a cell on the table having information pertaining to the carrier serving the link.

98. The method of claim 97 wherein the organizing step further comprises organizing the link demand information according to each link and the carrier supply information and the carrier goal information according to each carrier.

99. The method of claim 98 further comprising the step of employing linear programming to apply the constraints to the objective function to determine the solution.

100. The method of claim 99 further comprising the step of organizing the solution in the form of a table corresponding to the table of the obtained information.

101. The method of claim 89 wherein the obtaining travel cost information step comprises acquiring current travel data from a computerized reservation system.

102. The method of claim 89 wherein the obtaining travel cost information step comprises acquiring previously generated historical travel data from a historical travel data file.

103. The method of claim 89 wherein the obtaining demand and supply information and obtaining carrier goal information steps comprise acquiring the demand and supply information and the carrier goal information for the organization from a previously generated organization discount program data file.

104. The method of claim 88 further comprising the step of employing linear programming to apply the constraints to the objective function to determine the solution.

✓ 105. A computer system for determining a travel scheme for minimizing travel costs for an organization, where the organization expects to purchase travel trips for a plurality of travelers for a plurality of predetermined travel links, each travel link comprising a travel origin and a travel destination, each travel link being served by at least one of a plurality of travel carriers, the system comprising:

a data input device for receiving travel information relating to the carriers and the links;

a data storage device for storing the travel information received by the data input device;  
a programmed processor for constructing an objective function from the travel  
information, the objective function representing a travel cost to the organization to purchase  
travel trips for the plurality of travelers for the plurality of predetermined links;  
a programmed processor for constructing a set of constraints from the travel information,  
the constraints comprising restrictions relating to the objective function;  
a processor for applying the constraints to the objective function to determine a solution  
of the objective function that satisfies the constraints and that minimizes the travel costs the  
organization; and  
a data output device for generating a report representative of the solution.

106. The computer system of claim 105 wherein the travel information comprises  
travel cost information for each link for each carrier serving the link, demand and supply  
information pertaining to a projected demand for each link and a projected supply for each  
carrier, and carrier goal information pertaining to any predetermined goal the organization has  
with respect to any of the carriers.

107. The computer system of claim 106 wherein the processor determines from the  
travel cost information for each link for each carrier serving the link a weighted value  
representing an actual cost to the organization for traveling the link using the carrier.

108. The computer system of claim 107 wherein the objective function comprises the  
sum of a travel cost for each link, the travel cost for each link comprising the sum of a travel cost  
for each carrier serving the link, the travel cost for each carrier serving the link comprising the  
weighted value representing the actual cost to the organization for traveling the link using the  
carrier multiplied by a variable representing a number of trips to be purchased from the carrier  
for the link.

109. The computer system of claim 108 wherein the solution comprises a solution  
value for each variable.

110. The computer system of claim 109 wherein lower and upper limits for each constraint are determined by the processor, each constraint being adjustable between the limits while maintaining the determined solution.

111. The computer system of claim 109 wherein lower and upper limits for each solution value are determined by the processor, each solution value being adjustable between the limits while maintaining the determined solution.

112. The computer system of claim 108 wherein the constraints are derived from the demand and supply information and the carrier goal information, the constraints comprising link demand constraints, carrier supply constraints, and carrier goal constraints, the link demand constraints requiring that for each link the sum of the variables representing the number of trips to be purchased from all carriers for the link be equal to the projected demand for the link, each carrier supply constraint requiring that for a particular carrier the sum of the variables representing the number of trips to be purchased from the carrier for all links be in a predetermined range, each carrier goal constraint requiring that the goal the organization has with respect to a particular carrier be accomplished.

113. The computer system of claim 112 wherein the goal constraint comprises a predetermined discount from a particular carrier only if the carrier receives a minimum predetermined amount of business from the organization.

114. The computer system of claim 106 wherein the information retrieved by the processor is organized in the form of a table.

115. The computer system of claim 114 wherein the table is organized with each of the plurality of links laid out in a first direction and each of the plurality of carriers laid out in a second direction, each carrier serving each link being designated by a cell having information pertaining to the carrier serving the link.



116. The computer system of claim 115 wherein the link demand information is organized according to each link and wherein the carrier supply information and the carrier goal information is organized according to each carrier.

117. The computer system of claim 116 further comprising software for extracting information from the table to construct the objective function and the set of constraints and linear programming software for applying the constraints to the objective function to determine the solution.

118. The computer system of claim 117 wherein the solution is organized in the form of a table corresponding to the table of the obtained information.

119. The computer system of claim 106 further comprising a means for acquiring travel data from a computerized reservation system, wherein the travel cost information for each link for each carrier serving the link is compiled at least in part from the travel data.

120. The computer system of claim 106 further comprising a generated historical travel data file having historical travel data, wherein the travel cost information for each link for each carrier serving the link is compiled at least in part from the historical travel data.

121. The computer system of claim 106 further comprising a generated organization discount program data file having the demand and supply information and the carrier goal information for the organization.

122. The computer system of claim 106 wherein the travel cost information for each link for each carrier serving the link includes a member of the group selected from an expected fare the carrier charges for traveling the link, any discounts the carrier provides to the organization, any added costs in connection with traveling the link using the carrier, any benefits received in connection with traveling the link using the carrier, the number of non-stop voyages available, the number of connecting voyages available, any expected transfer delays, the percentage of total voyages the carrier provides for the link, and a combination thereof.

123. The computer system of claim 105 further comprising software executed on the processor for extracting information from the table to construct the objective function and the set of constraints and linear programming software for applying the constraints to the objective function to determine the solution.

A SUB A ✓ 124. A method for determining an optimum travel scheme for minimizing travel costs for traveling a plurality of travel links being served by a plurality of travel carriers by selectively allocating travel trips on each link to the carriers serving the link, comprising the steps of:

(a) determining travel information representative of the links and the carriers serving the links;

(b) determining constraints on allocating the trips to the carriers;

(c) prospectively allocating the trips among the carriers in accordance with the travel information and the constraints to provide a travel scheme;

(d) determining a cost of the travel scheme of step (c);

(e) ascertaining whether any of the travel information or constraints have changed;

(f) if any of the travel information or constraints have changed, then repeating steps (c), (d), and (e) until the optimum travel scheme minimizing the travel costs in accordance with the travel information and the constraints is determined; and

(g) generating a report representative of the optimum travel scheme.

125. The method of claim 124 wherein the determining travel information step comprises the steps of:

obtaining travel cost information for each link for each carrier serving the link;

obtaining demand and supply information pertaining to a projected demand for each link and a projected supply for each carrier; and

obtaining carrier goal information pertaining to any predetermined goal the organization has with respect to any of the carriers.

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126. The method of claim 125 further comprising the step of determining from the travel cost information for each link for each carrier serving the link a weighted value representing an actual cost to the organization for traveling the link using the carrier.

127. The method of claim 126 wherein the cost of the travel scheme comprises a function representing the sum of a travel cost for each link, the travel cost for each link comprising the sum of a travel cost for each carrier serving the link, the travel cost for each carrier serving the link comprising the weighted value representing the actual cost to the organization for traveling the link using the carrier multiplied by a variable representing a number of trips to be purchased from the carrier for the link.

128. The method of claim 127 wherein the optimum travel scheme comprises a solution value for each variable.

129. The method of claim 128 further comprising the step of determining lower and upper limits for each constraint, each constraint being adjustable between the limits while maintaining the optimum travel scheme.

130. The method of claim 128 further comprising the step of determining lower and upper limits for each solution value, each solution value being adjustable between the limits while maintaining the optimum travel scheme.

131. The method of claim 127 wherein the constraints are derived from the demand and supply information and the carrier goal information, the constraints comprising link demand constraints, carrier supply constraints, and carrier goal constraints, the link demand constraints requiring that for each link the sum of the variables representing the number of trips to be purchased from all carriers for the link be equal to the projected demand for the link, each carrier supply constraint requiring that for a particular carrier the sum of the variables representing the number of trips to be purchased from the carrier for all links be in a predetermined range, each carrier goal constraint requiring that the goal the organization has with respect to a particular carrier be accomplished.

132. The method of claim 125 further comprising the step of organizing the obtained information in the form of a table.

133. The method of claim 132 wherein the organizing step comprises organizing each of the plurality of links in a first direction on the table and each of the plurality of carriers in a second direction on the table, each carrier serving each link being designated by a cell on the table having information pertaining to the carrier serving the link.

134. The method of claim 133 wherein the organizing step further comprises organizing the link demand information according to each link and the carrier supply information and the carrier goal information according to each carrier.

135. The method of claim 134 further comprising the step of employing linear programming to apply the constraints to a function representing the cost of the travel scheme to determine the optimum travel scheme.

136. The method of claim 135 further comprising the step of organizing the optimum travel scheme in the form of a table corresponding to the table of the obtained information.

137. The method of claim 125 wherein the obtaining travel cost information step comprises acquiring current travel data from a computerized reservation system.

138. The method of claim 125 wherein the obtaining travel cost information step comprises acquiring previously generated historical travel data from a historical travel data file.

139. The method of claim 125 wherein the obtaining demand and supply information and obtaining carrier goal information steps comprise acquiring the demand and supply information and the carrier goal information for the organization from a previously generated organization discount program data file.

140. The method of claim 124 further comprising the step of employing linear programming to determine a solution.

A SubA2W 141. A method for determining an optimum travel scheme a plurality of travel links being served by a plurality of travel, comprising the steps of:

- (a) determining travel information representative of travel links and travel carriers serving the travel links;
- (b) determining constraints on allocating travel trips to the travel carriers;
- (c) prospectively allocating the travel trips among the travel carriers in accordance with the travel information and the constraints;
- (d) generating a travel scheme.

142. The method of claim 141 wherein the determining travel information step comprises the steps of:

- obtaining travel cost information for each link for each carrier serving the link;
- obtaining demand and supply information pertaining to a projected demand for each link and a projected supply for each carrier; and
- obtaining carrier goal information pertaining to any predetermined goal the organization has with respect to any of the carriers.

143. The method of claim 142 further comprising the step of determining from the travel cost information for each link for each carrier serving the link a weighted value representing an actual cost to the organization for traveling the link using the carrier.

144. The method of claim 143 wherein the cost of the travel scheme comprises a function representing the sum of a travel cost for each link, the travel cost for each link comprising the sum of a travel cost for each carrier serving the link, the travel cost for each carrier serving the link comprising the weighted value representing the actual cost to the organization for traveling the link using the carrier multiplied by a variable representing a number of trips to be purchased from the carrier for the link.

145. The method of claim 144 wherein the optimum travel scheme comprises a solution value for each variable.

146. The method of claim 145 further comprising the step of determining lower and upper limits for each constraint, each constraint being adjustable between the limits while maintaining the optimum travel scheme.

147. The method of claim 145 further comprising the step of determining lower and upper limits for each solution value, each solution value being adjustable between the limits while maintaining the optimum travel scheme.

148. The method of claim 144 wherein the constraints are derived from the demand and supply information and the carrier goal information, the constraints comprising link demand constraints, carrier supply constraints, and carrier goal constraints, the link demand constraints requiring that for each link the sum of the variables representing the number of trips to be purchased from all carriers for the link be equal to the projected demand for the link, each carrier supply constraint requiring that for a particular carrier the sum of the variables representing the number of trips to be purchased from the carrier for all links be in a predetermined range, each carrier goal constraint requiring that the goal the organization has with respect to a particular carrier be accomplished.

149. The method of claim 142 further comprising the step of organizing the obtained information in the form of a table.

150. The method of claim 149 wherein the organizing step comprises organizing each of the plurality of links in a first direction on the table and each of the plurality of carriers in a second direction on the table, each carrier serving each link being designated by a cell on the table having information pertaining to the carrier serving the link.

151. The method of claim 150 wherein the organizing step further comprises organizing the link demand information according to each link and the carrier supply information and the carrier goal information according to each carrier.

152. The method of claim 151 further comprising the step of employing linear programming to apply the constraints to a function representing the cost of the travel scheme to determine the optimum travel scheme.

153. The method of claim 152 further comprising the step of organizing the optimum travel scheme in the form of a table corresponding to the table of the obtained information.

154. The method of claim 142 wherein the obtaining travel cost information step comprises acquiring current travel data from a computerized reservation system.

155. The method of claim 142 wherein the obtaining travel cost information step comprises acquiring previously generated historical travel data from a historical travel data file.

156. The method of claim 142 wherein the obtaining demand and supply information and obtaining carrier goal information steps comprise acquiring the demand and supply information and the carrier goal information for the organization from a previously generated organization discount program data file.

157. The method of claim 141 further comprising the step of employing linear programming to determine a solution.

158. An article of manufacture for use in a computer system having a data input device, a data storage device, and a processor, the article of manufacture comprising a computer-readable medium holding computer executable instructions for performing a method for determining a travel scheme for minimizing travel costs for an organization, where the organization expects to purchase travel trips for a plurality of travelers for a plurality of predetermined travel links, each travel link comprising a travel origin and a travel destination,

each travel link being served by at least one of a plurality of travel carriers, the method comprising the steps of:

obtaining travel information relating to the carriers and the links via the data input device;  
storing the travel information via the data storage device;  
constructing an objective function from the travel information via the processor, the objective function representing a travel cost to the organization to purchase travel trips for the plurality of travelers for the plurality of predetermined links;  
constructing a set of constraints from the travel information via the processor, the constraints comprising restrictions relating to the objective function;  
applying the constraints to the objective function via the processor to determine a solution of the objective function that satisfies the constraints and that minimizes the travel costs of the organization; and  
applying the solution as the travel scheme for minimizing travel costs by purchasing travel trips in accordance with the solution.

✓ 159. An article of manufacture for determining a travel scheme for minimizing travel costs for an organization, where the organization expects to purchase travel trips for a plurality of travelers for a plurality of predetermined travel links, each travel link comprising a travel origin and a travel destination, each travel link being served by at least one of a plurality of travel carriers, the article of manufacture comprising a computer-readable medium holding computer-executable instructions for performing a method comprising the steps of:

obtaining travel information relating to the carriers and the links;  
constructing an objective function from the travel information, the objective function representing a travel cost to the organization to purchase travel trips for the plurality of travelers for the plurality of predetermined links;  
constructing a set of constraints from the travel information, the constraints comprising restrictions relating to the objective function;  
applying the constraints to the objective function to determine a solution of the objective function that satisfies the constraints and that minimizes the travel costs of the organization; and  
applying the solution as the travel scheme for minimizing travel costs by purchasing travel trips in accordance with the solution.



A Sub A3 /  
160. An article of manufacture for determining an optimum travel scheme for minimizing travel costs for traveling a plurality of travel links being served by a plurality of travel carriers by selectively allocating travel trips on each link to the carriers serving the link, the article of manufacture comprising a computer-readable medium holding computer-executable instructions for performing a method comprising the steps of:

(a) determining travel information representative of the links and the carriers serving the links;

(b) determining constraints on allocating the trips to the carriers;

(c) prospectively allocating the trips among the carriers in accordance with the travel information and the constraints to provide a travel scheme;

(d) determining a cost of the travel scheme of step (c);

(e) ascertaining whether any of the travel information or constraints have changed;

(f) if any of the travel information or constraints have changed, then repeating steps (c), (d), and (e) until the optimum travel scheme minimizing the travel costs in accordance with the travel information and the constraints is determined; and

(g) applying the optimum travel scheme to minimize travel costs by purchasing travel trips in accordance with such optimum travel scheme.

161. The method of claim 141 wherein the travel scheme comprises a preferred travel scenario.

162. The method of claim 141 wherein determining travel information includes receiving input from one or more users.

A Sub A4 /  
~~163. The method of claim 141 further comprising:~~

~~(e) determining a cost of the travel scheme of step (d).~~

A Sub A5 /  
~~164. The method of claim 163 further comprising:~~

~~(f) ascertaining whether any of the travel information or constraints have changed;~~  
and

(g) if the travel information or constraints have changed, repeating steps (c), (d), and (e) until an optimum travel scheme minimizing the travel costs in accordance with the travel information and the constraints is determined.

~~165. The method of claim 164 further comprising:~~

~~(h) generating output data representative of the travel scheme.~~

~~166. An apparatus for determining an optimum travel scheme a plurality of travel links being served by a plurality of travel, comprising the steps of:~~

~~(a) means for determining travel information representative of travel links and travel carriers serving the travel links;~~

~~(b) means for determining constraints on allocating travel trips to the travel carriers;~~

~~(c) means for prospectively allocating the travel trips among the travel carriers in accordance with the travel information and the constraints;~~

~~(d) means for generating a travel scheme.~~

~~167. The apparatus of claim 166 wherein the means for determining travel information further comprises:~~

~~means for obtaining travel cost information for each link for each carrier serving the link;~~

~~means for obtaining demand and supply information pertaining to a projected demand for each link and a projected supply for each carrier; and~~

~~means for obtaining carrier goal information pertaining to any predetermined goal the organization has with respect to any of the carriers.~~

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